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NORTH DAKOTA LIFE: PLANT, ANIMAL, AND
HUMAN.*

BY

WALLACE CRAIG.

INTRODUCTION.—THE CONDITIONS.

Thousands of emigrants, as our magazines have told us again and again, are thronging annually to the great plains of the Northwest, where wheat-farming has offered the home-seeker great financial opportunities. All Americans rejoice that these thousands of home-seekers are able to establish themselves financially. On the other hand, residents of the East, the South, or the Pacific Coast, who love a pleasing diversity of hill and dale, grove and meadow, lake and river, cannot but regret that millions of their fellows are doomed to live on the monotonous Western plain, and to gaze daily on a view which includes no hill, no valley, no grove of trees, no water, nothing but earth and wheat.

A period of residence in the Northwest confirms one in this vicarious regret. The writer, after having lived in many beautiful places, from the hills of Scotland and those of New England to the forests of Wisconsin, recently spent two years teaching in North Dakota; his first view of the new home gave him a shock even worse than he was prepared to receive. Any Eastern man, upon going to North Dakota, receives a similar first impression. He feels keenly the monotony of the vast level expanse, and the awful barrenness of a landscape without trees. Even the herbage appears to him of a barren sort, for it is never green like the grass of the East, but only a greenish gray. The severe winter puts a further check upon his

* Adapted from talks to the students of the State Normal School at Valley City, North Dakota; prepared for publication at the University of Chicago, and read in abstract before the Association of American Geographers, Chicago, Dec. 30, 1907.

impulse to enjoy nature; the low temperatures, the dangerous blizzards, the snow-blocked roads, and the almost complete disappearance of wild life make a walk in the country uninviting even to an enthusiast. Some even have expressed the opinion that all the interest of the plains has departed with the departure of the bison and the Indian, and that now the plain is but an indifferent tract, having all the monotony of the desert without the desert's wild fascination.

In order to give a better idea of these conditions, I shall give a brief characterization of them under the three heads of flatness, aridity, and severe winter.

The great plains of the Northwest extend for hundreds of miles, with no relief from their monotony. The absence of trees is an essential part of their monotonous flatness; so also is the dearth of waters. Here and there, where the surface is slightly dished, water gathers to form shallow, stagnant pools. These are in all cases salty or alkaline. In summer, the pools all shrink, and most of them disappear. Yet these are all that North Dakota possesses to call by the name of "lakes." Rivers are as poorly represented. A few valleys, long, narrow, and shallow, cut across the vast plain; when the snows are melting in the spring, each valley contains a sluggish, muddy stream; in summer, the channels, if not completely dry, contain but stagnant, noisome pools. Even the Cheyenne, one of the most important rivers in the State, has been known to dry up altogether. And these rivers lie scores of miles apart. Whole counties in North Dakota, counties about the size of small States, are without a single river. Indeed, one could fence off an area of North Dakota plains of the size and shape of Rhode Island, or of the size and shape of Delaware, without enclosing or even touching a river. Consider how many young Americans, living in farmhouses which look out upon nothing but plain and sky, have never seen a river, or a lake, or a hill; many, no doubt, have never seen a tree.

The absence of trees contributes not only to the flatness of the plain, but also to its appearance of barrenness. The grass of Dakota appears parched and brown for the greater part of the year; even when it is freshest, in spring it has but a greenish gray color. And the prairie flowers, though numerous, are either reduced in size or coarse in texture; few of them approach the delicate, expanded forms of our exquisite woodland species. In these respects, the vegetation of the plains approximates the vegetation of the desert, for the reason that the climate of the plains approximates the climate of the desert. Much of western North Dakota is so dry

that farming is impossible unless the soil is watered artificially. Eastward, the humidity and rainfall gradually increase, so that the climate of the eastern part of the State is eminently suitable to those crops that yield best in a rather dry atmosphere. Yet even the eastern part of the State has in some years suffered severe droughts. These drought years may help to explain to us the decidedly desert character of the native plants, for it is evident that the native plants must be adapted to the dryness, not of the average season, but of the driest season. Hence the absence of trees, the gray color of the grass, the dwarfed size of some flowers, and the coarse texture of others; for these are desert characteristics.

The average temperature for January is, in New York City 30°, in North Dakota 3°. Forty below zero in North Dakota is not uncommon. The soil freezes to a depth of six feet. The total snowfall is not excessive; but the winter is made odious by the blizzard, a storm of high wind carrying fine snow, which cuts the skin, blinds the eyes, obscures the landscape, and thus becomes dangerous to life. The fine snow drifts excessively, blockades the roads, and blows into the houses through every crack and keyhole. Drifting snow settles in the valleys; the small tributary valleys may become filled to the brim, and houses in them completely buried. The plains, in contrast, are swept bare in spots. In the account of the North-western plains, in Mill's *International Geography*, we find the following: "The blizzard is a violent cold-wave wind, at a temperature near zero F. or lower, drifting clouds of fine snow by which all land-marks are hidden. A guide of rope is needed in going a few hundred feet from a house to a barn in one of these freezing, blinding storms. Travellers on foot should be roped together, as if climbing Alpine peaks."*

Such are the conditions of life in the Northwest. Yet, millions are doomed to live there and to make the best of their surroundings. Now, my purpose in writing about the Northwest is to prove that those very conditions which are most unpleasant—the monotonous flatness, the barren appearance, and the severe winter—may become a never-failing source of pleasure to all who love the beauties and the wonders of nature. For these three conditions affect every phase of nature in the region where they obtain; they deeply affect, not only human life, but all forms of life, producing adaptations which are endlessly diversified and most interesting to study. The remainder of my paper will be devoted to an exposition of these interesting results which follow from the hard condi-

* Hugh Robert Mill, *The International Geography*. Appletons, 1902, p. 756.

tions already described. These will be presented in seven sections, treating the results in seven classes of phenomena: namely, (1) Atmospheric Appearances, (2) Plant-life, (3) Bird-Life, (4) Mammalian-life, (5) Indian-life, (6) Pioneer-life, (7) Civilization.

I. RESULTS IN ATMOSPHERIC APPEARANCES.

(1a) *Flatness*. The endlessly varied, ever new, and ever interesting aspects of the heavens fill a peculiarly large and important place in the life and thought of those who live in a flat country. The dominance of the sky over the landscape is brought about, in the first place, by the proportion which they bear to one another in the field of vision. For it is evident that the prairie offers a minimum view of the earth and a maximum view of the sky. The dominance of the sky over the landscape is, moreover, increased by the fact that the plain presents no salient points, nothing to catch the eye, and has, consequently, little hold upon the attention. The prairie view is, in this particular, precisely similar to a view in mid-ocean.

On the other hand, the prospect on the prairie or on the ocean is characterized by vast horizontal range, conveying an impression of boundlessness and freedom. Yet since this extension is all on a level surface, it does not encroach upon the domain of the sky. Quite the contrary, for objects seen at a distance are partly below the horizon. The tops of distant grain elevators are seen over the horizon of the prairie, just as the topmasts of distant ships are seen over the horizon of the ocean. The mariner can locate a steamship beyond the horizon, even telling its distance with much accuracy, by the mere appearance of a streamer of smoke; by a strikingly similar streamer of smoke, the farmer can locate a thrashing-engine beyond the horizon of the prairie. It is said that the Indians, by observing a dust-cloud rising beyond the horizon, could tell whether the dust was raised by the wind, by sheep, or by horses; if by horses, whether they were a pair, a dozen, or a score, and whether their riders were Indians or white men.*

The mirage, a phenomenon so well known that I need only mention it, is characteristic of flat surfaces in general, being usually ascribed to the desert, the ocean, and the Arctic. It is a common appearance on the plains.

Everyone has seen, on the ocean, or at least in pictures of the ocean, the brilliant train of light which extends across the water-

* Richard E. Dodge, *Life Amid Desert Conditions*. Bull. Am. Geog. Soc., XXXIV, 1902, p. 417.

surface from the sun to the observer; it is called, poetically, "the sun-wake." On the prairie one sees an analogous train of light, though in the reverse direction; for if one stands on the prairie and looks away from the sun, he sees a brilliant band on the plain, beginning around his own shadow and extending straight away toward the horizon. It is seen best, I think, when the wheat is in stubble, and is then a band of golden hue. This phenomenon is due to the fact that every little wheat-stalk in the band presents its sunny side to the observer; and it is obvious that the band could reach perfection only on a plain surface. My reason for describing this pretty circumstance is, not that it is in itself important, but that I believe it is only one of many phenomena, commonly passing unnoticed, which a careful observer on the prairie may easily discover.

The similarity between the prairie and the other types of level topography, such as the desert, the ocean, and the Arctic, which has been mentioned in regard to atmospheric appearances, extends to nearly all the other phenomena which we shall consider.

(1b) *Aridity*. Though the flat surface is a condition favoring atmospheric appearances, the primary cause of most of these phenomena is the condition of the atmosphere itself. The moisture-free atmosphere of the prairie, like the moisture-free atmosphere of the desert,* is singularly productive of beautiful phenomena; first, because of its clearness and freedom from clouds; secondly, because of its color-effects.

The sky of Dakota is seldom overcast with clouds. Day after day the fields are blest, from sunrise till sunset, with the undimmed, unstinted light; and the brightness of the days affects men's minds with a brightness and cheerfulness which goes far to compensate for the dullness of the landscape. The sky at night is equally worthy of observation. On nights of full moon, the moonlight is so powerful as to hide all but a few of the very brightest stars. On starlit nights in the dark of the moon, the number, the brilliance, the twinkling, and the colors of the stars are heightened to a degree unknown in moister regions.

The dry air has also, as I have said, a peculiar excellence in producing color-effects. A moist atmosphere, which reflects the light from water particles like fog or mist, looks thick and heavy, has little depth, and is whitish, grayish, or dull-colored. But a dry atmosphere, which reflects the light from fine, thinly scattered dust particles, looks light, airy, and pellucid, its hues are vivid and its changes are opalescent. The everyday sunset in Dakota is such as,

*John C. Van Dyke, *The Desert*, Scribners, 1901.

in the East, would call forth all the people to see a magnificence so unusual. And there are occasions when, the sun being low and all conditions favorable, the celestial tints are extended over the plain itself; the horizon line vanishes; the sky encroaches upon the domain of the earth; the entire field of vision becomes one vast firmament of varied, harmonized, blended colors.

(1c) *Severe Winter.* The interest and beauty of the sky are augmented by the aurora borealis and many other meteoric appearances which are indigenous in cold northern latitudes. Halos of extraordinary size, brilliance, and variety; intersecting halos; parhelia, sun-dogs, or mock-suns; vertical arcs passing through the rising sun or moon; gigantic arcs ascending similarly from the headlights of distant locomotives; similar vertical arcs ascending to the heavens from every street light in a town; all such appearances, occurring daily in the coldest weather, are to be explained by the form and position of minute ice crystals in the air.

Not only in the appearances of the sky and air, but in those of snow, frost, and steam, the cold northern winter produces works of marvellous beauty. The fine, drifting snow of the blizzard, stinging, blinding, and altogether disconcerting to those who must face it, leaves, when the storm has passed, the manifold gracefulness of the snowdrifts, the exquisite tracery round every crack through which the wind blows, and the brilliant scintillation which is peculiar to blizzard snow. This last is due to the form of the flakes: everyone knows that snowflakes show a variety of beautiful forms when viewed through a lens, or even with the unaided eye; it ought to be known also that these forms vary with locality, and that the severe winters of the Northwest produce more numerous varieties than do the milder winters of the East. Again, the frost on the window-pane, that fairy-land of childhood and recurrent delight of maturity, is far more abundant and infinitely more varied in the cold winter of the North. The frost on the landscape, too,—on grass-blades, fences, and telephone-wires—gathers thicker in Dakota than ever it does in Illinois or Ohio. Even the numerous steam-clouds of civilization are augmented and diversified by the low temperatures to such a degree that steam must be reckoned with snow and frost among the beauties of the Dakotan winter. On cold mornings the very chimneys of the houses send forth little clouds of pure white steam.

A thoughtful observer on the prairie, noticing day by day these ever-changing atmospheric phenomena, must find such a study interesting and profitable through his whole life.

2. ADAPTATIONS IN PLANT-LIFE.

(2a) *Flatness.* Living beings are affected by the level configuration of the plains chiefly from the fact that a level plain is easy to travel. The plants as well as the animals are affected by the ease of travel. Seed dispersal is, in a large proportion of prairie plants, effected by the wind; the winds of the plains are ever strong but never violent, their course is not obstructed by trees or other prominences; they are thus a safe and efficient means of dispersal. Accordingly, we find the seeds of prairie plants very commonly provided with feathery hairs, wings, or little parachutes of one kind or another. The consummation of this adaptation in prairie plants is seen in the tumbleweed, which is rolled by the winds over the level ground, scattering seeds along its path. Suitable to this purpose, the tumbleweed grows in numerous branches in the form of a sphere, the centre of gravity is near the centre of the sphere, the weight is light, but the texture is strong and durable, the sphere becomes detached from the root at the proper time, and the seed-vessels are such as to drop the seeds a few at a time along the path; truly a marvellous co-ordination of adaptations!

In another respect also, adaptation to the plain among plants foreshadows that among animals. We shall see that the animals of the plain are distinguished by the habit of forming large herds or societies; similarly the plants form large associations. (The term "association," in botany, means an aggregation of plants growing in one place under the same conditions of soil, moisture, and so forth.) In a diversified region, especially in a mountainous region, each plant association can extend over but a small area; it may be limited on one side by a change of slope, by an alteration in the soil or the subsoil, or even by a mountain-shadow, any one of which may be sufficient to stop the spread of this particular association; it may be limited on another side by a wall of rock, by a sheer descent, or by some other condition which makes the growth of plants impossible; consequently, a rough mountain region is always divided botanically into small parts, some supporting one kind of plant association, some another, some being rich in plants, some poor, and some yielding no plants at all. To such a diversified condition, the uniformity of the prairie is diametrically opposed; the prairie is, over enormous areas, so uniform in every respect, that the same plants cover the surface for miles together. Though this contributes to the monotony of the prairie, it is interesting in its significance for all animal life, because large plant associations provide for large animal societies.

(2b) *Aridity.* When a west-bound traveller passes from Wisconsin through Minnesota and North Dakota, the panorama which he sees from his car-window presents a gradual and continuous change from forest through prairie to semi-arid plain. This change is not a mere disappearance of trees; it is a very complex alteration, deserving a detailed analysis.

In the first place, the trees are observed to become more and more restricted to the river-valleys, which, at long intervals, cut the surface of the plain; and even before the State of Minnesota has been crossed, the trees become absolutely so restricted. One can see this in diagrammatic perfection while riding in the cars of the Soo* Line through Ransom County, North Dakota. Here, after travelling for hours over an unbroken, treeless plain, one suddenly discerns ahead of the train a break in the ground, filled with foliage; soon the train crosses the spot and one sees that it is a sharp-cut river-valley (the Cheyenne), filled to the brim with trees, the boughs all ending at the level of the prairie as evenly as if they had been artificially trimmed. The trees in this situation are supplied with water from the soil of the valley, and sheltered from the dry, searing winds of the plain. Their habitat, we may say, is subterranean. We shall see directly that subterranean existence characterizes the plains life in general.

A second fact noticed in the westward journey is, that the trees outside the river-valleys, as they become reduced in number, also become dwarfed in size, dwindling to mere shrubs a foot in height. This reduction in height is not confined to trees, for we may observe a parallel reduction in the size of herbs. The *Oenotheras*, or evening-primroses, afford an excellent illustration of such reduction. In Wisconsin, these are among the tallest of herbs (2-5 ft., Gray), but as we pass toward the plains we find them shorter and shorter, until in western North Dakota we find the *Oenothera* with no stem visible, its leaves springing, as we say, from the root. The prairie plants in general are reduced in size, they hug the ground, they expose a minimum surface to the air. The extreme reduction of exposed surface is seen in the cactuses (common throughout Dakota), which consist of a low, thick stem, few or no branches, and no functional leaves. The scientist's explanation of all this reduction of exposed surface is that it prevents excessive loss of water in the intense sunshine and dry atmosphere.

The appearance of dwarfing is somewhat deceptive, for the prairie plants have a comparatively colossal growth underground. Forests,

* Sault Ste. Marie.

though they display a very tall growth above ground, may have a very shallow growth below. In a dark, water-logged forest the roots do not penetrate the earth, but merely skim its surface; even the trunks of the trees are slender, branchless and leafless, each a skeleton of wood reared to uphold a small crown of leaves. The trees are in danger of death by drowning and want of light, and they are reaching, pushing, striving upwards for the precious sun and air. On the plains the reverse is true. The life-giving sunlight is abundant and free—it is water that is scarce; hence the prairie plants must retrench above and extend below. An herb of the plains which looks insignificant above ground may possess an enormous root or a large underground stem. The consequent toughness of the prairie sod, requiring great teams of oxen to break it, is notorious. The various food roots and tubers do splendidly in the Dakotas; potatoes give an unusual yield; sugar-beets make trouble by growing too large,* radishes, carrots, and turnips grow to giant size. The short prairie grass has long roots which have been traced to a depth of six feet,† and we may believe that in some cases they extend much deeper. Alfalfa, which appears above-ground like a good-sized clover plant, has been known to send its roots down 129 feet vertical; this is equal to the height of a very tall tree. Considering this extensive underground development of prairie plants, we might almost maintain that the prairie is a forest which grows down into the ground instead of up into the air.

In another respect also, the apparent poverty of the prairie flora is not altogether real; the plants are, for their size, unusually rich in life-giving substances. We may say of the prairie forms among plants what President Jordan said of the darters among fishes, that they are not dwarfed, but concentrated. The grass of the plains, when cattle are pastured on it, compensates for its scanty bulk by its extraordinarily nutritious quality. The hard kernel of the celebrated North Dakota wheat is another expression of the general tendency to concentration. This wheat is purchased at high prices by all the States from Illinois to the Atlantic seaboard, because those States, with their moist atmosphere, cannot produce that hard, concentrated kernel.

A third feature of the arid flora, already touched upon in the Introduction, is indicated by the color of the grass and herbage, which is not green, but only greenish gray. The gray shade is due to an outer coat which protects the plants from desiccation in the

* S. Dak. Agr. Exp. Sta. Bull., 56, 1898, p. 30.

† A. M. Ten Eyck. N. Dak. Exp. Sta. Bull. No. 43, 1900.

dry atmosphere. The herbs and leaves of a moist region have a thin epidermis, and consequently appear watery, translucent, and green. The outer coats of all prairie plants, on the other hand, are thick, hard, and dry, obscuring the green contents, and giving a dull grayish appearance to every blade and leaf. This appearance is much increased in some cases by a coat of dry scales (*e.g.*, *Elæagnus argentea*), or hairs, as in sage-brush (*Artemisia*, many sp.), Indian-tobacco (*Antennaria*), and the pasque-flower (*Pulsatilla hirsutissima*). A dense silky-hairy coat gives a beautiful appearance to the individual plant; an abundance of such coats gives a pleasing silvery sheen to the whole landscape.

The fact that the grayish appearance of the plants is merely superficial must be added to what was said before of the concentration and the subterranean enlargement of the prairie flora, to show how deceptive is the appearance of barrenness on the plains. The prairie flora looks far poorer than it really is, simply because its riches are hidden and protected, not put on display. But the farmer who grows North Dakota wheat, the gardener who grows the giant root-crops, and the ranchman who feeds his cattle on the plains, realize in practical experience that the richness of plains-grown plants is out of all proportion to their diminutive size and mean appearance.

The three adaptations to aridity thus far mentioned—the subsidence of trees into the river-valleys, the subsidence of plains vegetation deep into the ground, and the dry outer coats which protect the moist inner parts of the plants—are adaptations which characterize the flora of the plains in general. I wish now to call attention to two adaptations which characterize not all, but some, of the plants of the plains; these are: first, the “compass-plant habit”; secondly, the production of thorns or spines.

First: Everyone has heard of the compass-plant, by means of which a traveller on the prairies can, when the heavens are overcast, determine the cardinal directions. As a matter of fact, so many different plants are of this sort that botanists have come to speak of the “compass-plant habit.” Plants having this habit grow with their leaves vertical, the edges directed north-and-south; the leaf surfaces thus face east and west, so that they receive the full benefit of the morning and the evening sun but are not exposed to the too intense rays at noon. The compass-plant habit is thus an adaptation to the dry air and brilliant sunlight.

Secondly: The other adaptation of a portion only of the prairie flora is the development of spines. Some of the cactuses produce,

in addition to the customary array, a peculiarly vicious variety in the form of minute barbed bristles which are freed from the plant by the slightest touch; numbers of these, becoming attached, unobserved, to the clothing or the skin continue to work in and to irritate until the exasperated sufferer makes a minute examination, and with fine forceps removes each tiny bristle. Spines are of general occurrence on plains and deserts, and evidently serve to protect the plants from being eaten. David Livingstone* gives an interesting account of how in the Kalahari Desert certain plants are eaten by all animals to slake their thirst; mice, antelopes, and men, and even hyænas, jackals, and lions, eat these in times of drought. The favourite resource of thirsty animals is a kind of watermelon. Another resource is the Leroshua, a plant of double interest to us; Livingstone tells us that this appears above ground as an insignificant thing of linear leaves and stalk no larger than a crow's quill; but the native digs down a foot or eighteen inches and discovers a tuber, often as large as the head of a young child; the tuber is eaten and found always delicious, cool, and refreshing. Thus the Leroshua shows that desert plants are in much danger of being eaten by animals, and are, therefore, in need of such protection as is afforded by spines.† The Leroshua beautifully illustrates the statement made above, that plants of dry regions retrench above ground and expand below.

(2c) *Severe Winter.* The cold winter of Dakota necessitates abundant adaptations in the flora; but these adaptations are almost entirely the same as those which afford protection against the dry atmosphere. The injurious effect of cold, the botanists tell us, is much the same as the injurious effect of drought—removal of water; drought deprives the plants of water by evaporation, cold deprives the plants of water by freezing, and the effect is in the two cases essentially the same. All the adaptations mentioned above as being universal in the arid flora—the condensed form, reduction of surface, reduced transpiration, special coverings of cortex and scales and hairs, subsidence of plains plants into the ground and subsidence of trees into the river-valleys—all protect equally from summer's drought and winter's cold.

Of all these protective adaptations, however, that of living underground is unquestionably the most potent against the cold.

* David Livingstone, *Missionary Travels and Researches in South Africa*, Harpers, 1858, pp. 53-54.

† Some botanists are of opinion, however, that the production of spines is a merely adventitious result of the desert conditions, and that spines are not more needed, though they are more abundant in desert plants, than in others.

Underground parts are protected not only by the sheet of soil, but also by the blanket of snow. It was said in the last section (2b) that the trees are restricted to the river-valleys, and that they grow in the valley just up to the plains level and no higher; this was explained as due to the moisture of the valleys and their protection from the drying winds of the plains. Essentially the same condition obtains in winter when such valleys become filled to the brim with snow and the trees are thus protected from the winds which desiccate by freezing. On the exposed plain, on the other hand, where many spots are swept bare of the protecting snow, there are no trees, the vegetation dying almost completely down to the ground every winter. This is one of many facts which sharply distinguish the plains proper from the valleys by which they are intersected. This same fact of all but universal retirement underground to pass the winter distinguishes the plains vegetation from that of the comparatively mild-wintered Eastern States, where many green stems and green leaves may be found even in January. On the plains of North Dakota, the winter sleep is a very deep sleep.

(Conclusion in BULLETIN for July.)

THE HIGHEST POINTS IN STATES IN THE UNITED STATES.

BY

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The question often arises, which is the highest point in the State and what is its altitude? For some of the States, reference to the geographies, atlases, encyclopedias, and State reports will answer the question accurately, but for others there is great diversity of opinion as to the highest peak or locality. Figures of altitudes differ widely, and in some cases no data are recorded. The Gannett Dictionary of Altitudes, published by the U. S. Geological Survey, gives figures for many of the highest peaks, but does not provide for all parts of all the States. Most of the high mountains have been measured by either the U. S. Geological Survey or the U. S. Coast and Geodetic Survey, and so far as the facts have been recorded they should be utilized in correcting the discrepancies in the atlases